HIGH ALTITUDE OBSERVATORY

Boulder, Colorado

5 March 1965

National Aeronautics and Space Administration
Office of Research Grants and Contracts
1520 H Street NW
Washington, D. C. 20546

Attention: Code BG

Subject: Status Report No. 6 for NASA Grant NsG-136-61

Gentlemen:

This letter constitutes Status Report No. 6 for the period 1 July 1964 through 31 December 1964 under NASA Grant NsG-136-61. Activity during this period centered around various aspects of Jupiter radio emission.

Two extremely important developments took place: the discovery of the decisive modulation or control exerted by Jupiter's satellite Io (Jupiter I, at a distance of about six planets' radii) on the decametric emission; and the measurement of the decametric emission's complete polarization and spectral characteristics (performed in the range 24 to 36 Mc/s) at 10-millisecond repetition rate.

The Io effect was discovered by Bigg, using Jupiter data obtained in the course of this project, and catalogued by W. T. Kreiss. This catalogue has been published by World Data Center A (for Solar Activity). G. A. Dulk spent a major portion of the report period examining and interpreting the structure of the effect in determining the character of the dynamic spectra. It appears that we deal with a physical phenomenon similar to the one proposed by T. Gold to explain the Imp discovery of a lunar magnetosphere. At Jupiter, the effect of trapping of the magnetic field by Io is exaggerated greatly due to a combination of favorable circumstances.

M. A. Gordon, with the assistance of R. H. Lee, and using a sweep-frequency receiver loaned by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, has developed and operated a fast-sweep dynamic spectrograph for Jupiter studies. First installed in Boulder, this device showed that the Faraday effect, very similar to the one described by Dulk and Warwick earlier, was also present in the decametric Jupiter radiation at or near the source of the radiation in Jupiter's ionosphere. The decisive evidence is the occurrence of Faraday fringes in the two circular states, as well as in the linear state. In addition, on a very few occasions, this spectrograph, finally operated on the Arecibo 1000-foot dish, has detected extremely fast, intense bursts -- faster than the 10-millisecond resolution of the equipment. These bursts also show extraordinary polarization and spectral phenomena. Description of the effects is proceeding apace as of the end of the report period.

The measurement of solar burst phenomena continues. Phase calibration has proved successful for records made during the first full year of operation of the spectrographic interferometer, starting from July 1959. This means that we can establish burst positions for the extraordinary activity of late March 1960. This began, in our records, with a major II - IV sequence on 28 March 1960, several days earlier than the first reported solar cosmic rays.

Travel by Warwick included a trip to the Cap Sounion Conference, to the Paris Observatory (where he studied the old Lyot catalogues on emission-line polarization), and twice to Arecibo, Puerto Rico. These trips were made at no expense to the grant.